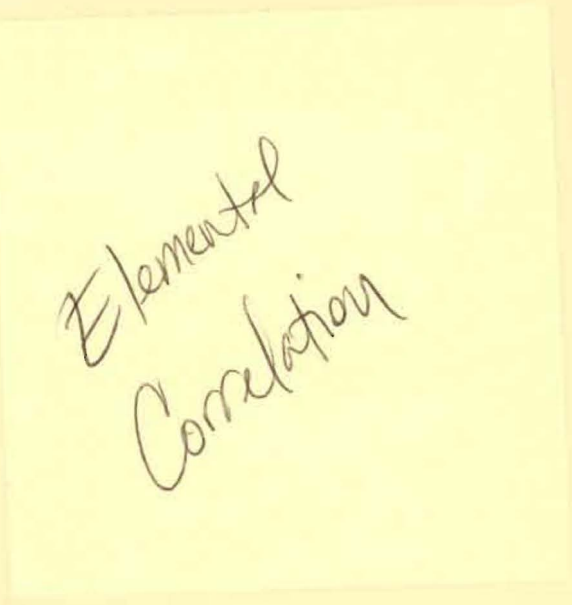
Elemental Correlation



Elemental Correlation

Nick Magriples/R2/USEPA/US
08/03/2009 06:24 AM

To Kimberly Staiger/R2/USEPA/US@EPA, EricJ Wilson/R2/USEPA/US@EPA, Mark Maddaloni/R2/USEPA/US@EPA
cc
bcc
Subject Fw: Preliminary thoughts

fyi
----- Forwarded by Nick Magriples/R2/USEPA/US on 08/03/2009 06:23 AM -----

Brad Venner/NEIC/USEPA/US
07/31/2009 05:50 PM

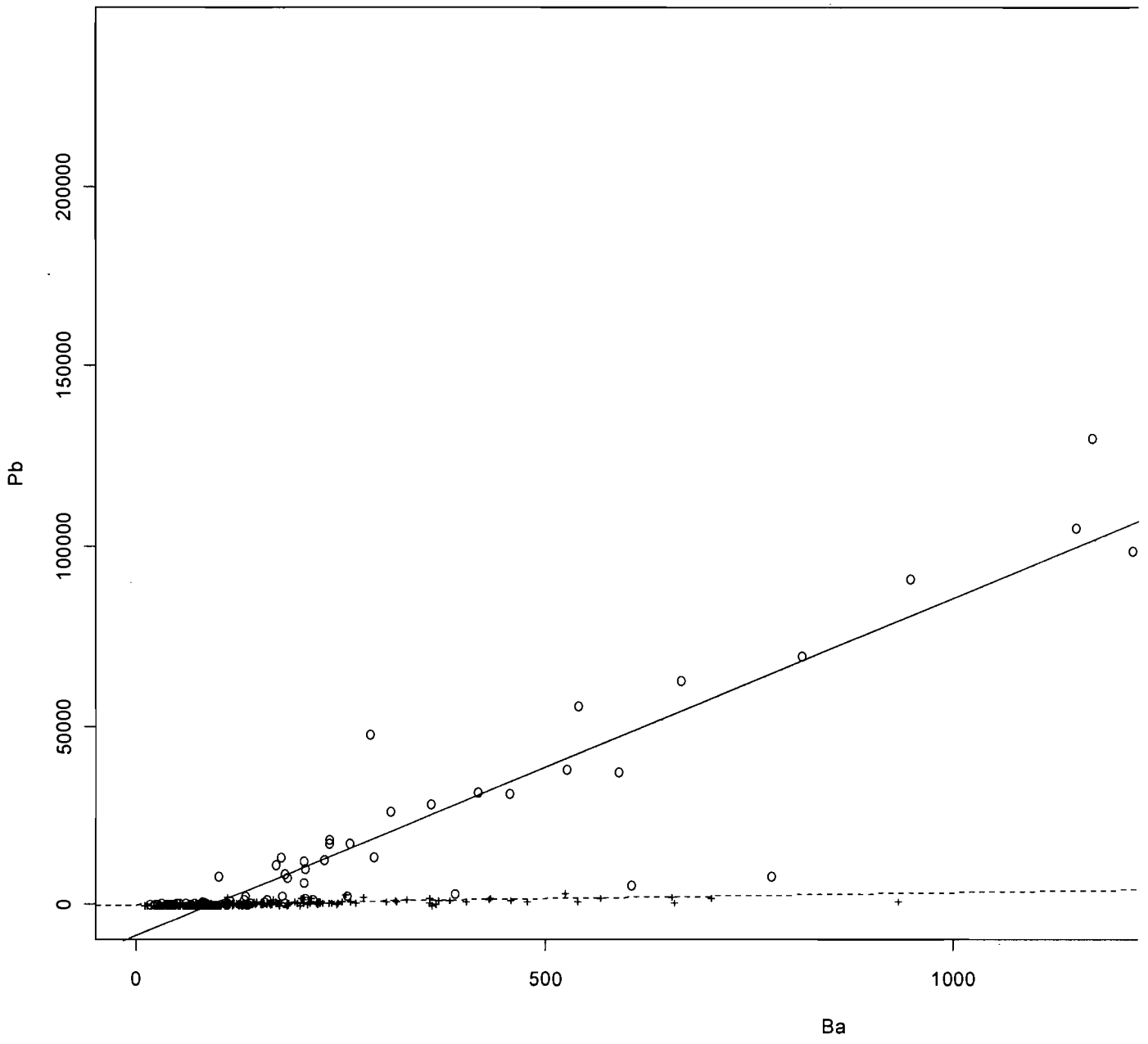
To Nick Magriples/R2/USEPA/US@EPA
cc Joe Lowry/NEIC/USEPA/US@EPA
Subject Preliminary thoughts

Nick,

I've taken a look at the off-site data. My preliminary observations are:

The detection limits for antimony, silver, and cadmium are not low enough to discern the pattern that was observed in the on-site data. These elements all had about a 1:100,000 ratio with lead. The mean lead result for the offsite samples was 600 ppm, which would imply that a detection limit of around 10 ppb would be necessary to distinguish these samples.

There is a reasonably strong relationship between barium and lead in both the off-site and on-site samples. However, the lead/barium ratio for the on-site samples is considerably higher than the ratio in the off-site samples. An illustration of this relationship is below.



The on-site samples showed a relationship between manganese and lead. This does not occur in the off-site samples. The manganese detection limits are sufficiently high to detect this relationship if it does exist.

Thus, there is not much evidence showing contamination of the off-site samples from a source similar to the on-site samples. Of course, absence of evidence is not evidence of absence.

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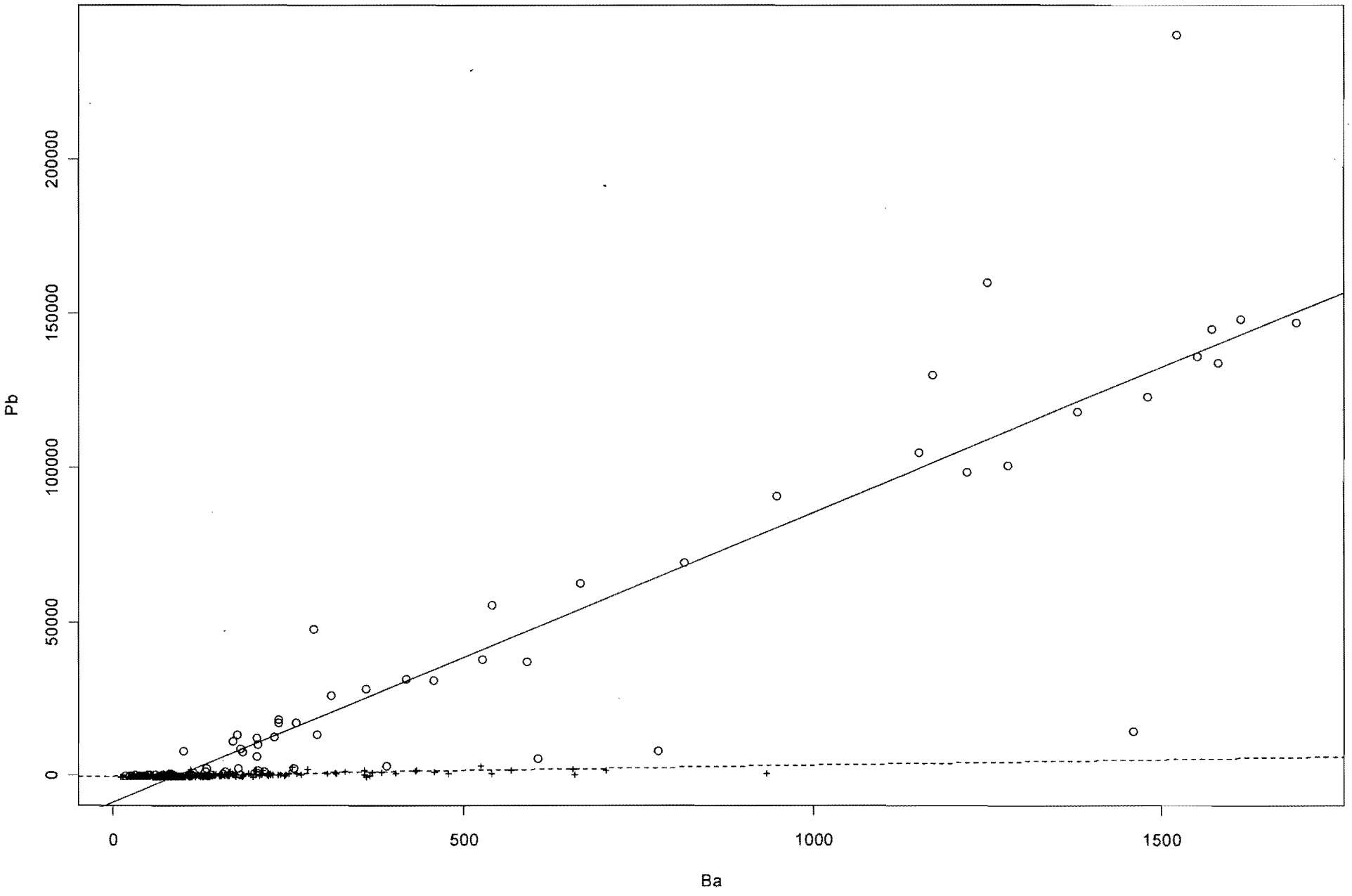

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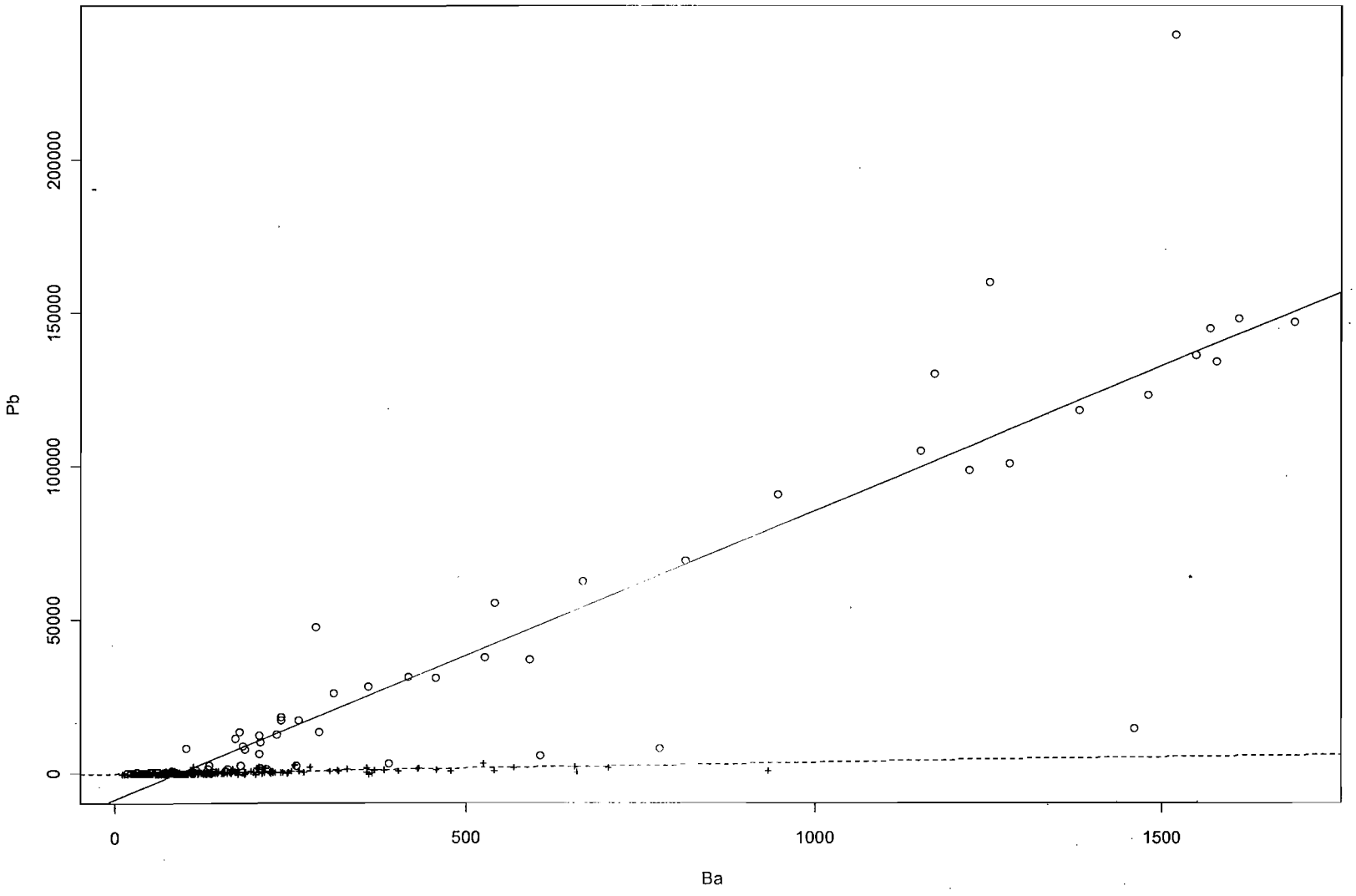


Brad
Venner/NEIC/USEPA/US
11/05/2009 11:46 AM

To Kimberly Staiger/R2/USEPA/US@EPA
cc hosick.theresa@epa.gov, Joe Lowry/NEIC/USEPA/US@EPA
bcc
Subject Re: Jewett White Lead elemental correlation

Kim,

I've attached a couple graphics files that show the complicated effect of depth on the Pb-Ba relationship. The first of these shows the relationship on a log scale, while the second on the normal scale. The two are related in that a slope difference in the normal scale is a difference in the intercepts on the log scale. There are two relatively distinct groups, and some of the 3-foot depth samples are in this group, but so are some of the surface samples. Feel free to give me a call and we can discuss these - 303-798-5333.

pb-vs-ba.pdf

pb-vs-ba-nolog.pdf

Kimberly Staiger---11/03/2009 07:13:10 AM---Hello Theresa, I just have a quick question regarding the eler

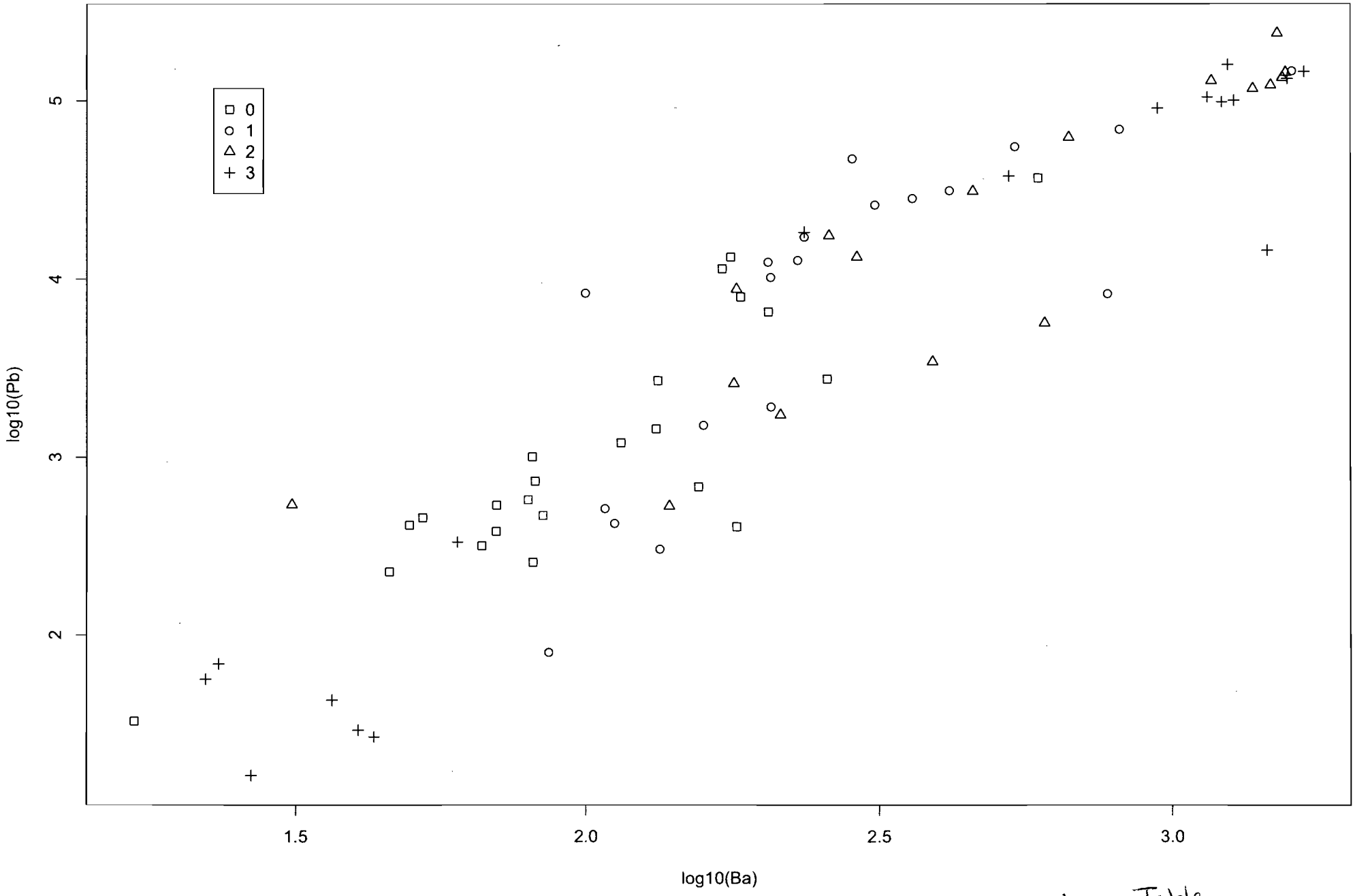
From:	Kimberly Staiger/R2/USEPA/US
To:	hosick.theresa@epa.gov
Cc:	Joe Lowry/NEIC/USEPA/US@EPA, Brad Venner/NEIC/USEPA/US@EPA
Date:	11/03/2009 07:13 AM
Subject:	Jewett White Lead elemental correlation

Hello Theresa,

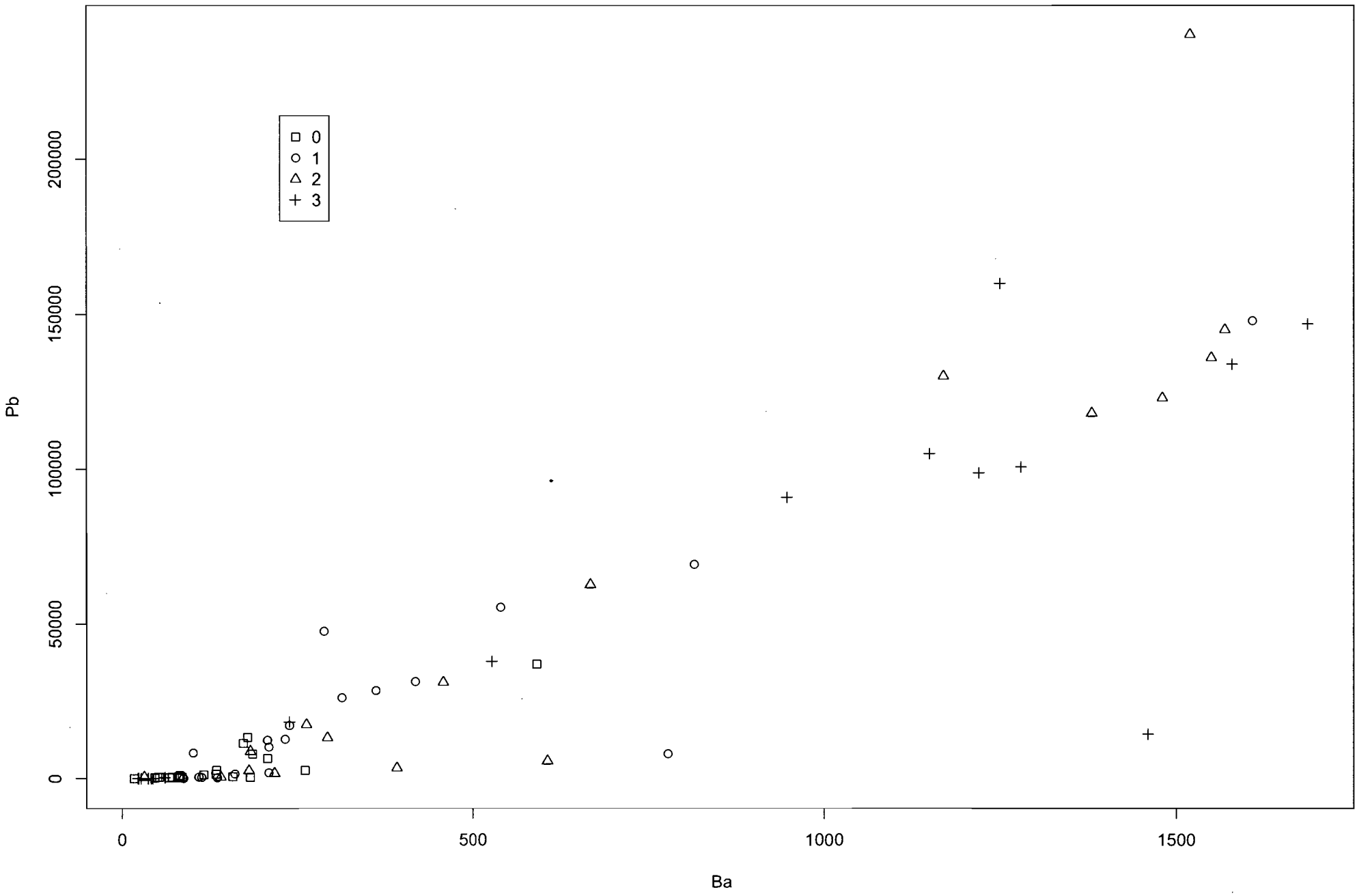
I just have a quick question regarding the elemental correlation performed on the Jewett White Lead samples. I know that we had seen a relationship between Barium and Lead in the on-site soil samples collected that was considerably higher than the ratio seen in the off-site samples. Was there a difference between the samples collected on the surface of the site vs. the samples collected at depth?

I'm scheduled in the Regional Response Center this week and can be reached either via e-mail or by phone at (732) 482-1000. I look forward to discussing this with you!
Thanks,
Kim

Kimberly Staiger
On-Scene Coordinator
USEPA Region II
Removal Action Branch
(732) 452-6415 - office
(908) 420-4510 - cell
staiger.kimberly@epa.gov

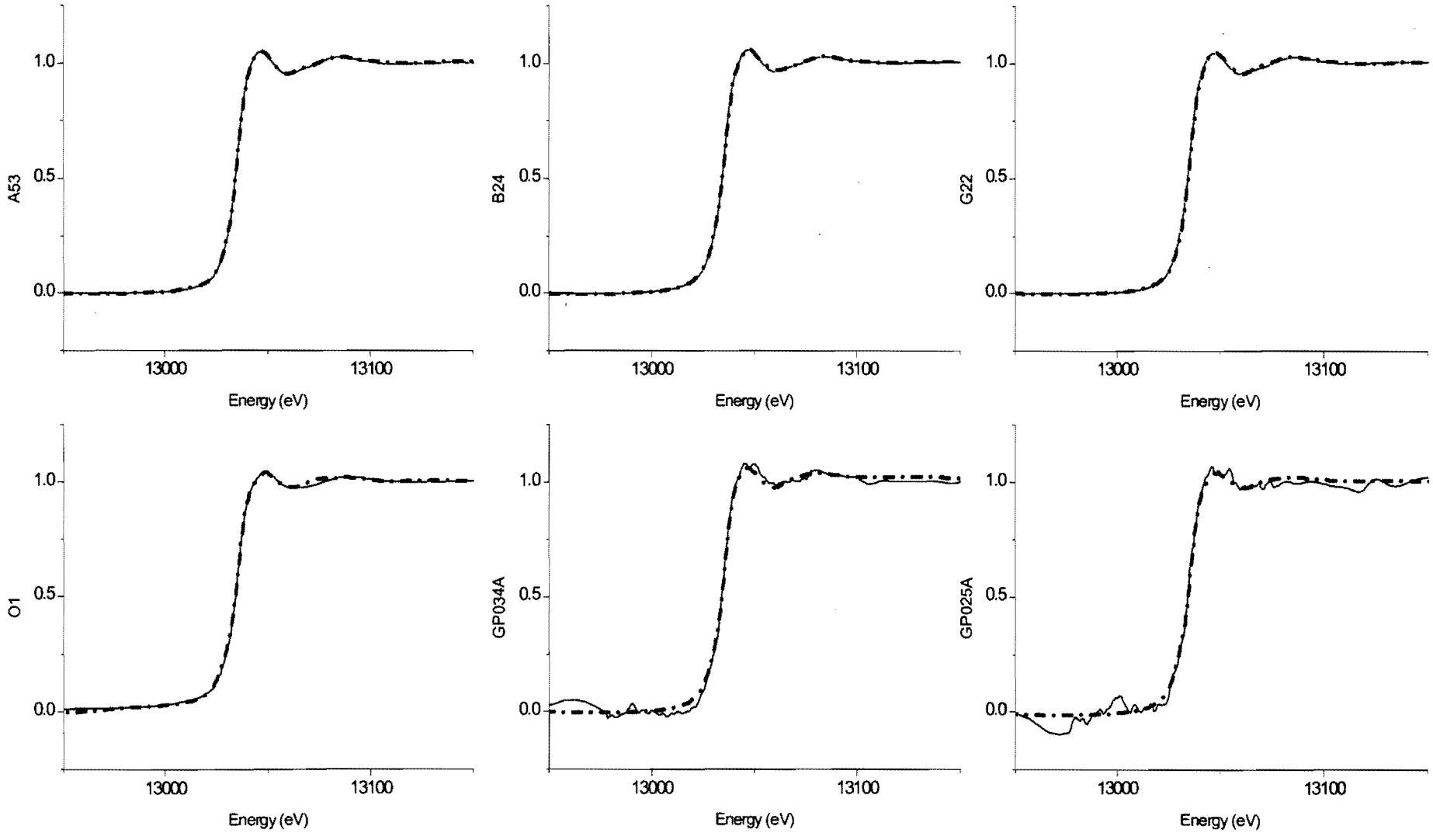


Log Table
(Grouping / Intersects)



Non-log table - (Linear)

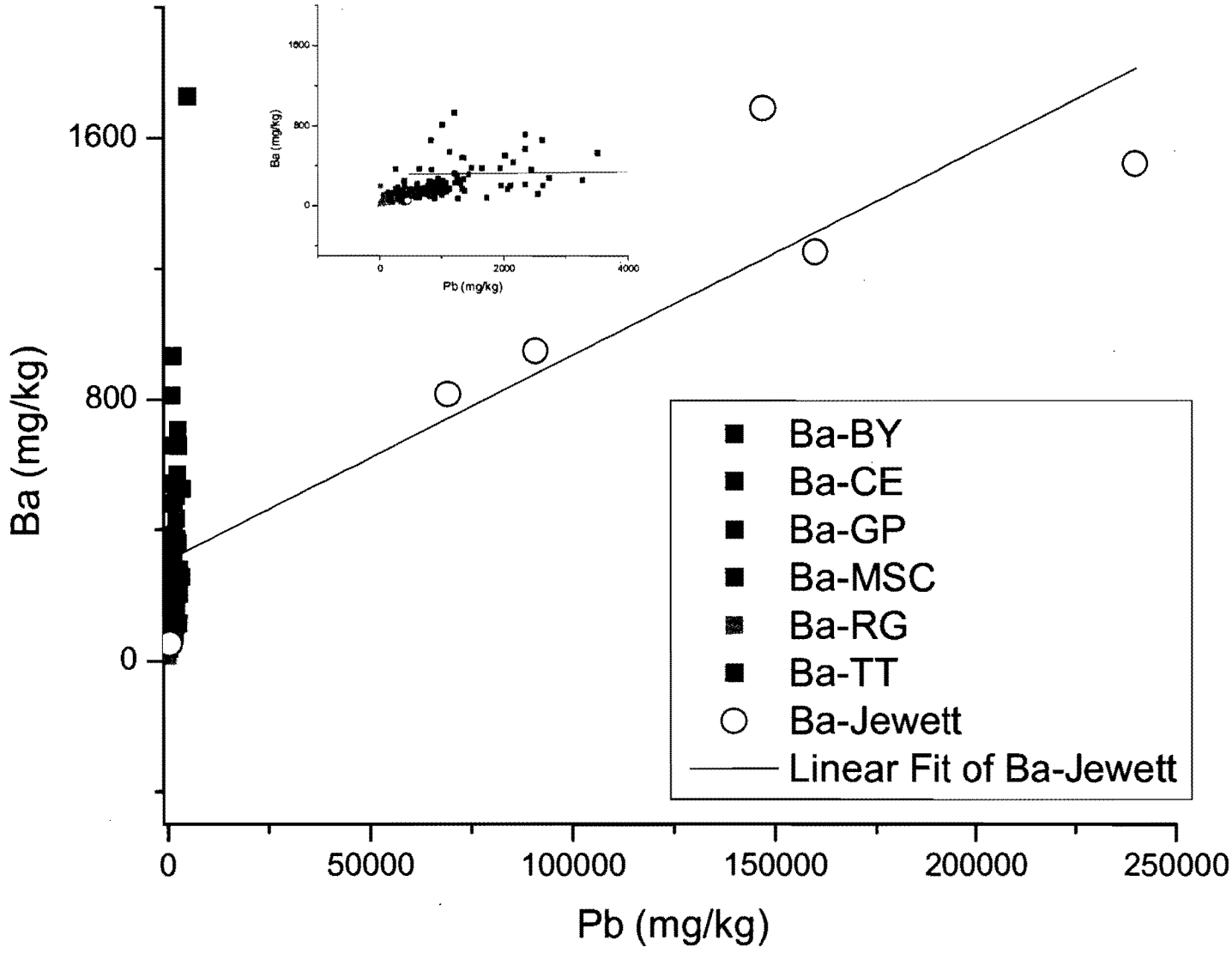
XANES analysis of some samples from the Jewett site and recently collected off-site samples. The black curve for each figure is the raw data and the red curve is the linear combination fitting curve. Samples GP034 & GP025 were smoothed to improve appearance; data collection can be improved for these samples.

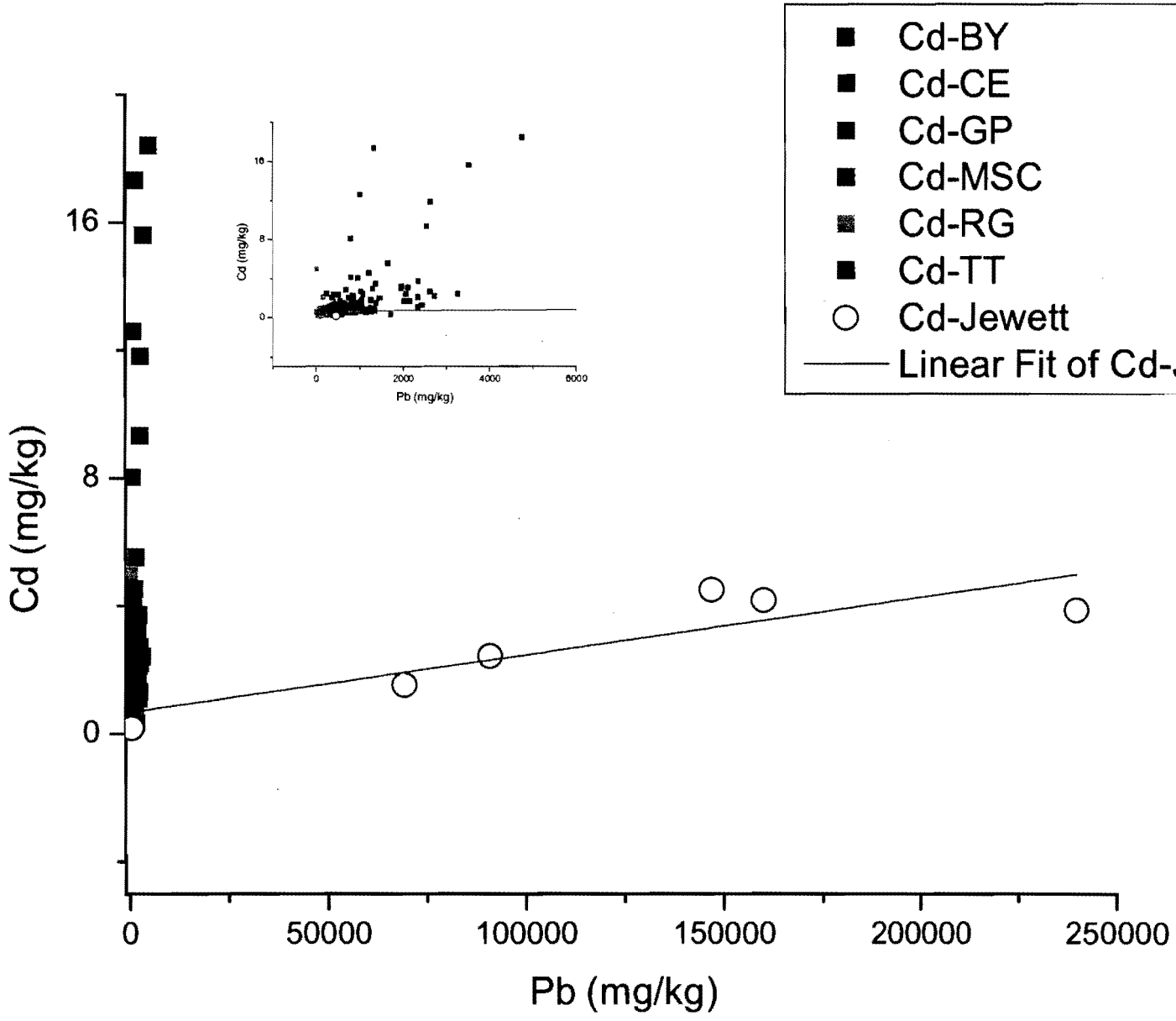


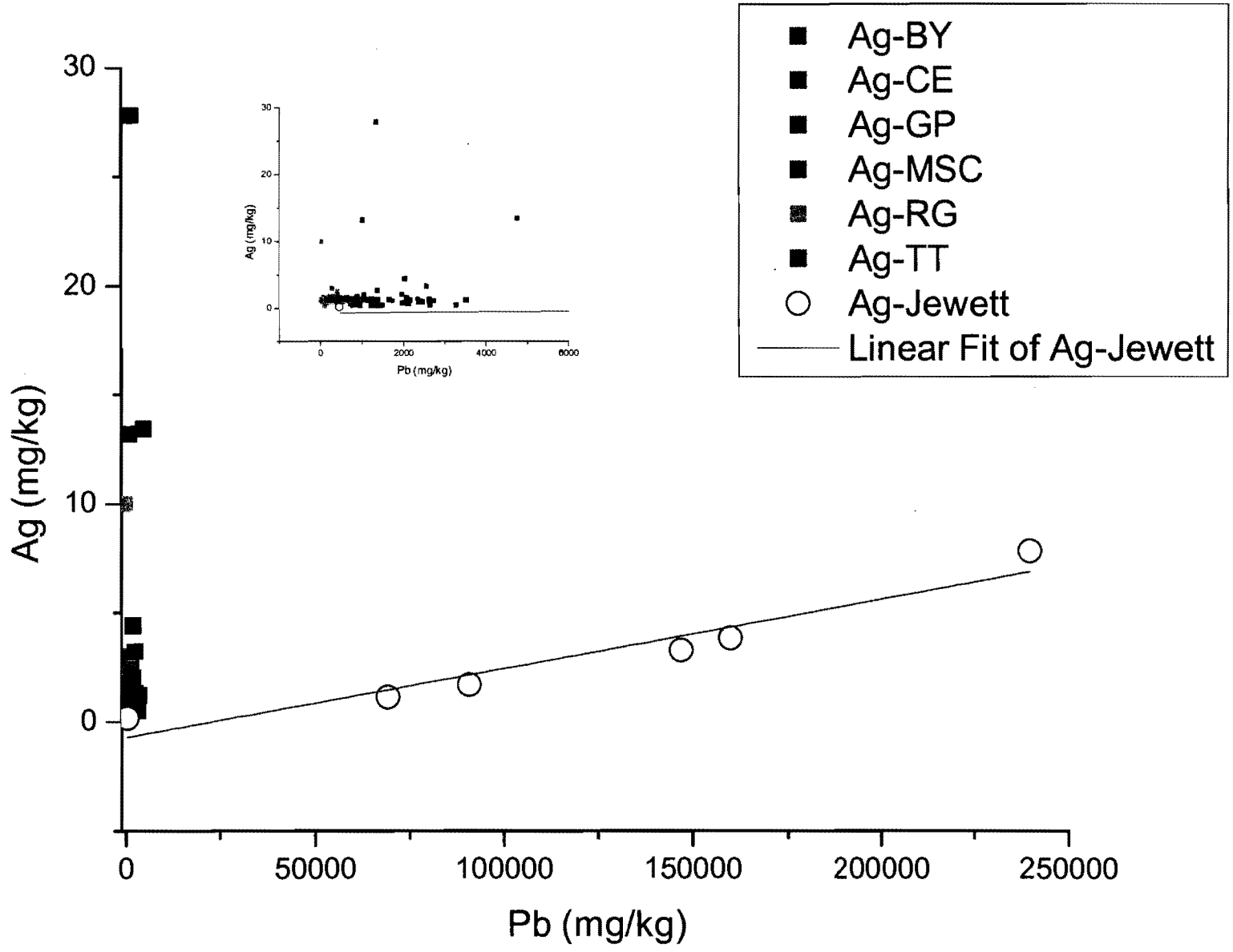
Linear combination fitting results for some samples. The possible phases were identified from a larger inventory of reference phases by principal component analysis. The contribution of each Pb phase for a sample are presented as weighted percentages. F-test verifies the validity of the analysis and residual is the error. Note the increase in error for the off-site samples. For the most part, adsorbed Pb was the dominant phase followed by Pb carbonate (cerussite). These results are in-line with previous work at Pb contaminated sites. It is difficult to draw a conclusion if the off-site soils are different than the Jewett soils.

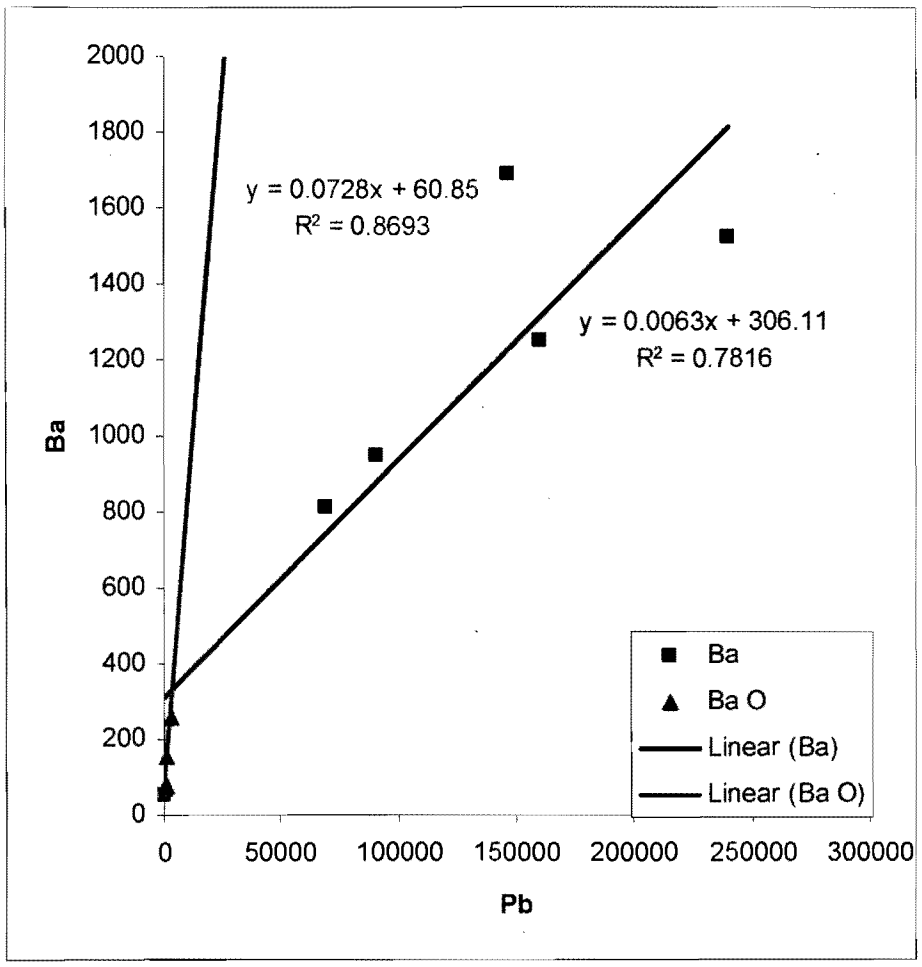
Sample	Sorbed Pb	Anglesite	Cerussite	Hydrocerussite	Litharge (Yellow PbO)	Massicot (PbO)	Red Lead (Pb3O4)	F-Test	Residual
A53	63	0	12	0	0	25	0	1	0.14
B20	93	6	1	0	0	0	0	1	0.72
B24	83	3	13	2	0	0	0	1	0.27
C33	64	0	16	6	9	6	0	1	0.51
G22	69	0	18	0	5	9	0	1	0.40
O1	66	16	3	7	0	8	1	1	0.62
O2	99	1	0	0	0	0	0	1	0.34
GP_034A	20	18	26	16	11	9	0	1	3.15
GP_025A	34	21	14	12	11	9	0	1	3.69

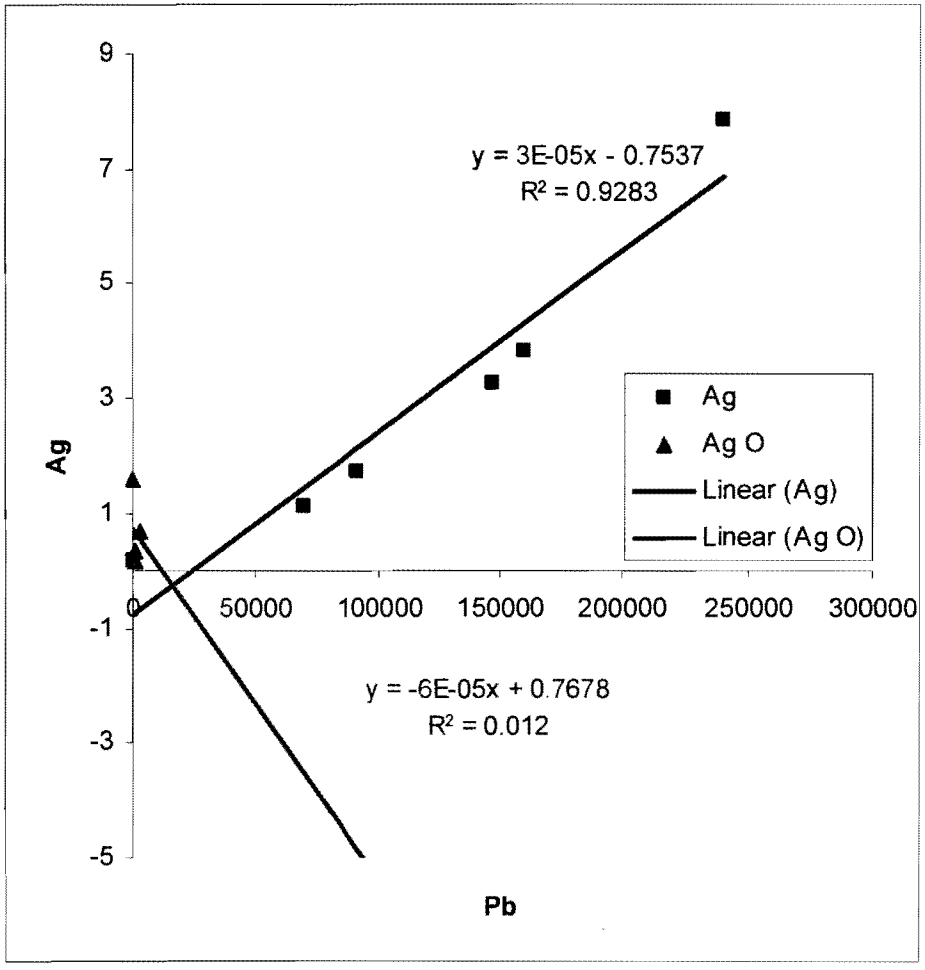
The next few slides are some quick correlation plots of Pb vs. Ba, Cd, and Ag which produced the best relationships for the Jewett samples previously examined.


Ba (mg/kg)
1600
800
0
0
50000
100000
150000
200000
250000
Pb (mg/kg)
Ba-BY
Ba-CE
Ba-GP
Ba-MSC
Ba-RG
Ba-TT
Ba-Jewett
Linear Fit of Ba-Jewett
Ba (mg/kg)
1600
800
0
0
2000
4000
Pb (mg/kg)

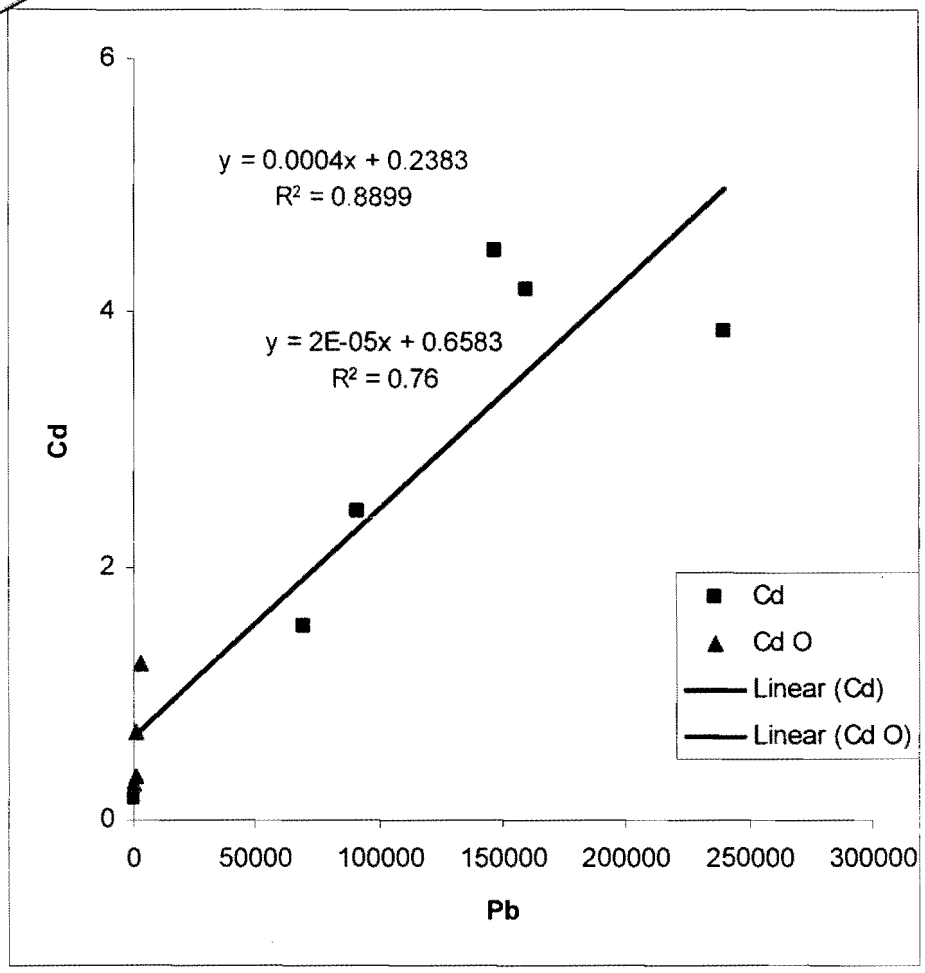

Cd-BY
Cd-CE
Cd-GP
Cd-MSC
Cd-RG
Cd-TT
Cd-Jewett
Linear Fit of Cd-Jewett
Cd (mg/kg)
Pb (mg/kg)
0
8
16
0
50000
100000
150000
200000
250000
Cd (mg/kg)
Pb (mg/kg)
0
2000
4000
6000

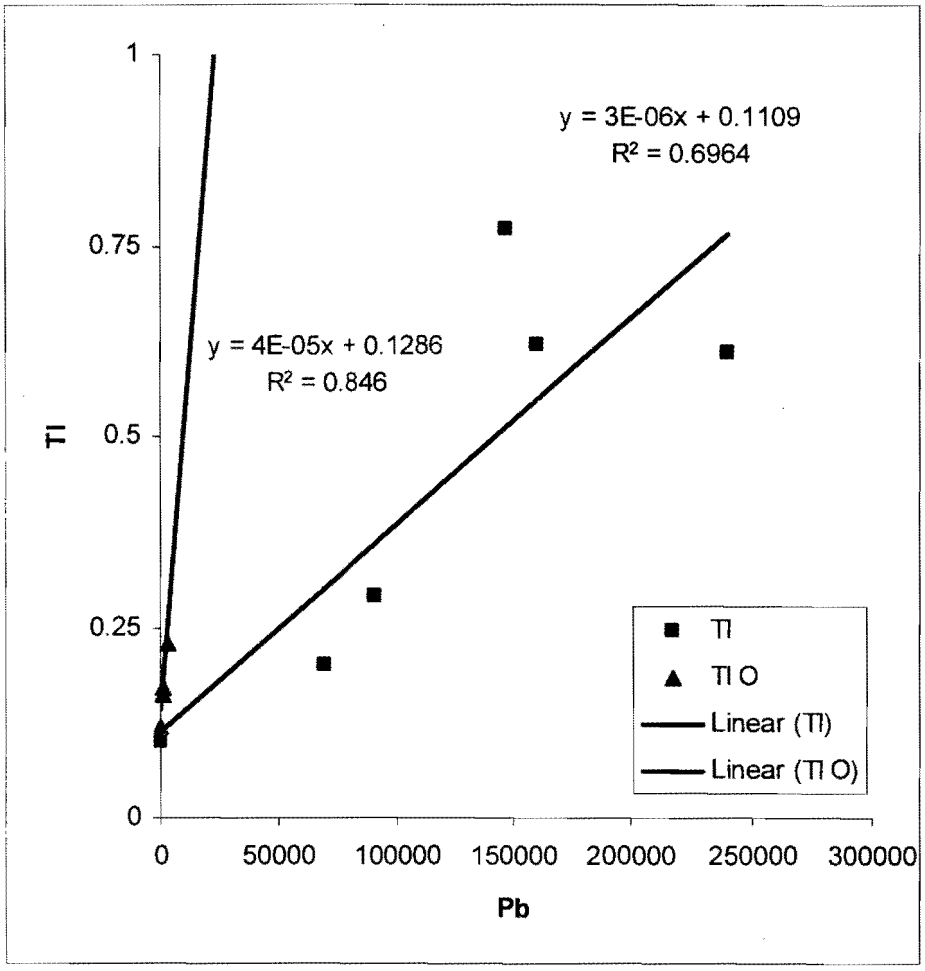

Ag-BY
Ag-CE
Ag-GP
Ag-MSC
Ag-RG
Ag-TT
Ag-Jewett
Linear Fit of Ag-Jewett
Ag (mg/kg)
Pb (mg/kg)
0
10
20
30
0
50000
100000
150000
200000
250000
2000
4000
6000

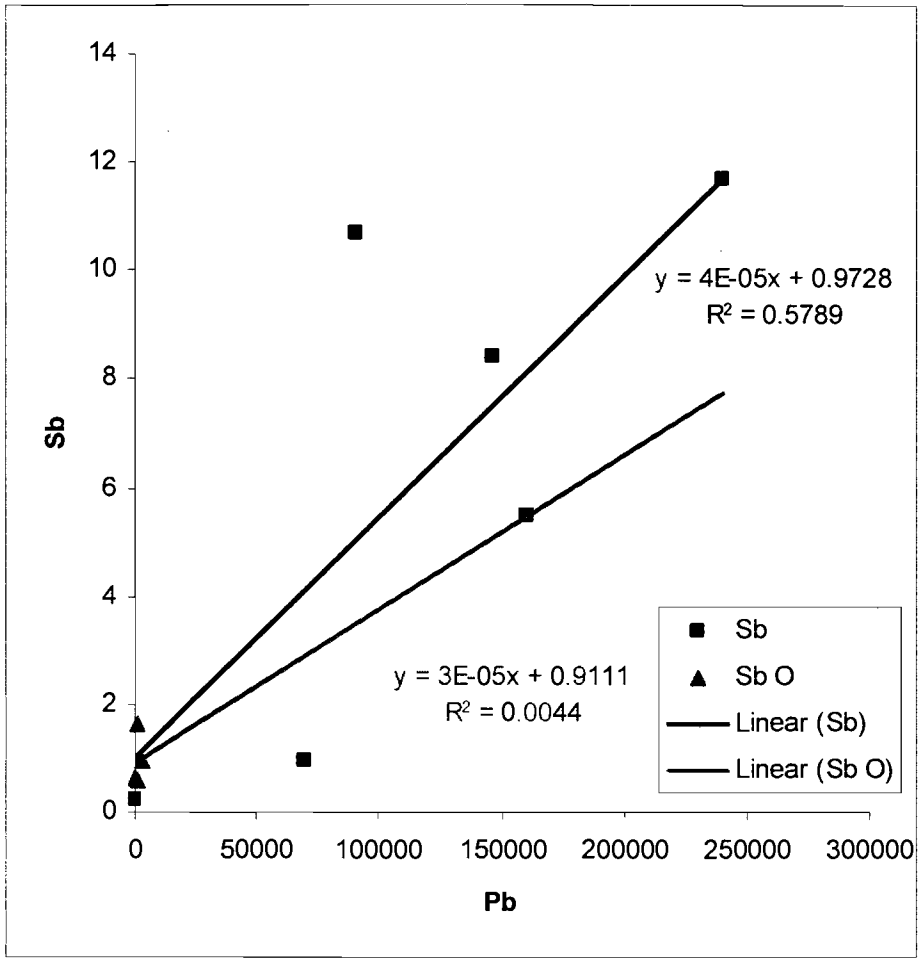




Black data points and trend line represent on-site samples and red data points and trend lines represent the two "O" samples.


y = 0.0004x + 0.2383
R² = 0.8899
y = 2E-05x + 0.6583
R² = 0.76
Cd
Cd O
Linear (Cd)
Linear (Cd O)
Cd
Pb
0
2
4
6
0
50000
100000
150000
200000
250000
300000


y = 3E-06x + 0.1109
R² = 0.6964
y = 4E-05x + 0.1286
R² = 0.846
Tl
Tl O
Linear (Tl)
Linear (Tl O)
Tl
Pb
0
0.25
0.5
0.75
1
0
50000
100000
150000
200000
250000
300000


14
12
10
8
6
4
2
0
Sb
0
50000
100000
150000
200000
250000
300000
Pb
y = 4E-05x + 0.9728
R² = 0.5789
y = 3E-05x + 0.9111
R² = 0.0044
Sb
Sb O
Linear (Sb)
Linear (Sb O)

What we know –

- In June, we conducted extensive off-site sampling in the Port Richmond community to determine not only if Jewett had impacted neighboring properties, but also if other lead sources existed in this community. Sampling entailed background areas, residential backyards adjacent the Site, grassy patches in 6 block area surrounding the site, beneath the train trestle both near the site and in a background area, and road grit in all areas sampled and along Richmond Terrace away from the Site.

- Background grass patch samples are observationally higher in the 0-2", 2-6" depth intervals than the grass patches collected "near" site.
    - 0-2" depth: 788 ppm bkgd vs. 666.1 ppm near site
    - 2-6" depth: 791.9 ppm bkgd vs. 663 ppm near site

- Statistically, at all depths, the grass patch samples are similar in lead content
-
- Almost all GRASS PATCH samples (regardless of area) exceed 400 ppm
    - Only one in background > 1200 ppm at 0-2"

- The statistical average lead concentration in the backyards within the block sampled = 549.1 ppm in the surface soils (0-2")

- Statistical average at depth in the backyards = 674.8 (2-6"); 902.2 (6-12")

- Of note, the highest concentration of lead is seen in the samples collected nearest the homes in the residential backyard sampling.

- Samples collected closest to the homes are biased samples. The highest 3 samples collected were in backyards based upon (+) XRF, next to a structure.

- No spatial distribution pattern observed in the backyard or grass patch samples
    - No concentration gradient observed

- Samples under the train trestle nearest the site appear to decrease in concentration the further you get from the site; HOWEVER, the train trestle samples collected in the background area show greater avg concentration of lead. (683.4 ppm vs. 1039 ppm)

- Road grit samples are generally lower in concentration than any other samples collected.

- Background area was determined based upon distance from the Jewett site (approx ¼ mile), and prevailing wind direction (out of the NW).

- Possibility that other lead sources exist: municipal waste incinerators; wind blows from Linden, Sea Warren, Newark, Bayonne to Staten Island (unknown emissions containing lead); Bayonne Bridge; elevated rail line; etc.
- Attribution analysis (lead isotopic ratio analysis) so far has indicated that the lead concentrations seen in the 2 off-site samples (2,760 and 383 ppm) collected "near" site in Dec 2008 are from a different source than those seen on-site at depth, but similar to that seen on-site at the surface (456 ppm). Appears to be indicative of atmospheric deposition... Additional analysis being conducted. Anticipate receiving results in 3-4 weeks.

- Other attribution analysis conducted did not provide the information needed to determine if lead is from Jewett.

  - XAS (speciation): due to time constraints, only able to complete analysis on 2 off-site grass patch samples. Found SO FAR, that lead in the Jewett samples on-site showed indications of containing lead carbonate; this is a common form of lead in the environment, and the most common found in soils.

  - Elemental Correlation: Found that a relationship existed in the off-site samples that was different from the relationship seen in on-site samples. But since other contributing sources may be present, this does NOT confirm that the lead seen off-site is NOT from Jewett. (Absence of evidence is not evidence of absence)

  - XRD (xray diffraction): Lead levels seen in the off-site samples were too low to perform the XRD analysis.

  - Lead Isotopic Ratio Analysis: Samples run so far indicate that deeper on-site samples have signature from lead ore found in Africa and Europe. This is consistent with information we found on the source of lead ore used in early Jewett operations. The off-site samples do not have this same signature.

Next Steps:

- wait for attribution analysis
  - will tell us if background is truly background; or if we need to be looking elsewhere to collect background samples
- conduct a background study in backyards
- collect additional XRF samples from the properties already sampled to provide more detailed information on possible contributing sources
- awaiting public health recommendations from local and State Health Depts

Conclusions:

- do not have conclusive data indicating that lead in residential properties is from Jewett and not other environmental lead sources
- High levels of lead seen in the background area
- Based upon attribution analysis generated so far, and the background data, it appears that we are seeing a wide-spread urban lead problem in this area that may not be related to the Site.

Discussion w/ Brad Verner 11/5/09

— Elemental Correlation —

No log scale – plots Pb vs. Ba.
Slope shows relationship btwn Pb + Ba.
Looks like 2 different slopes.
~~high slope includes~~

- Higher amt of Pb to Ba samples occur at depth
- Surface samples appear to be more impacted by this source than anything else

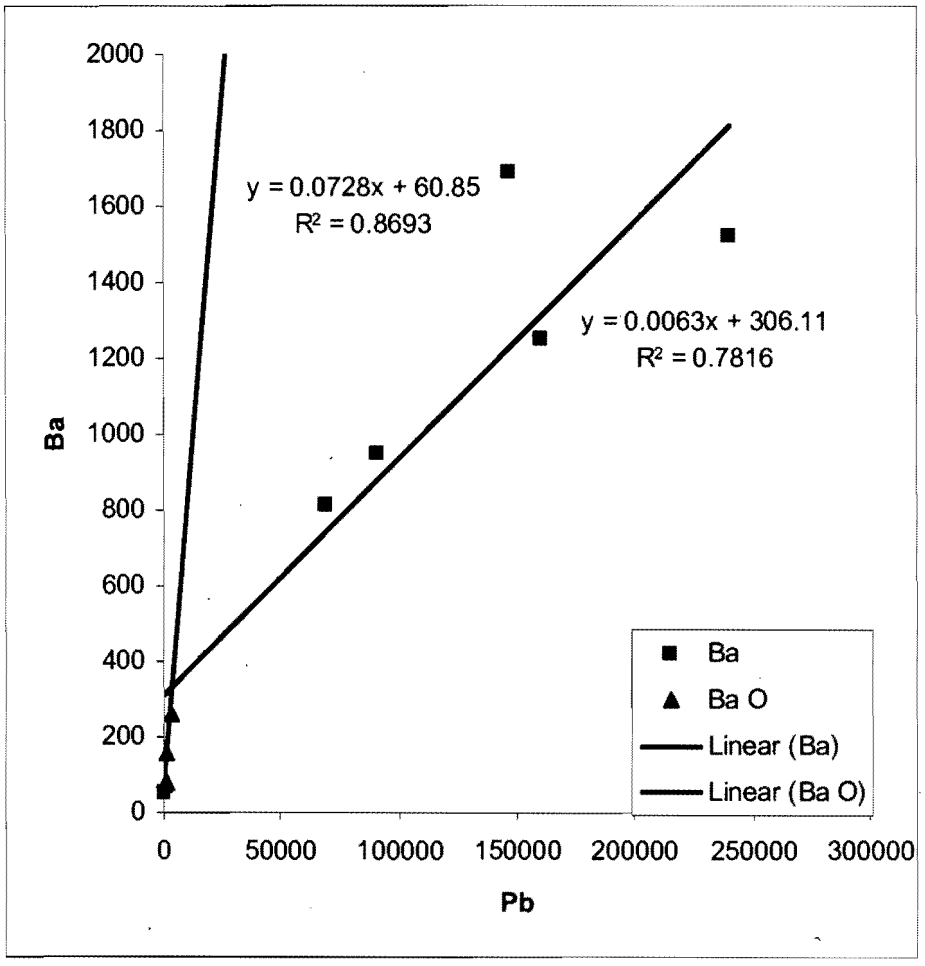
On log/log scale looking at differences in intercepts.

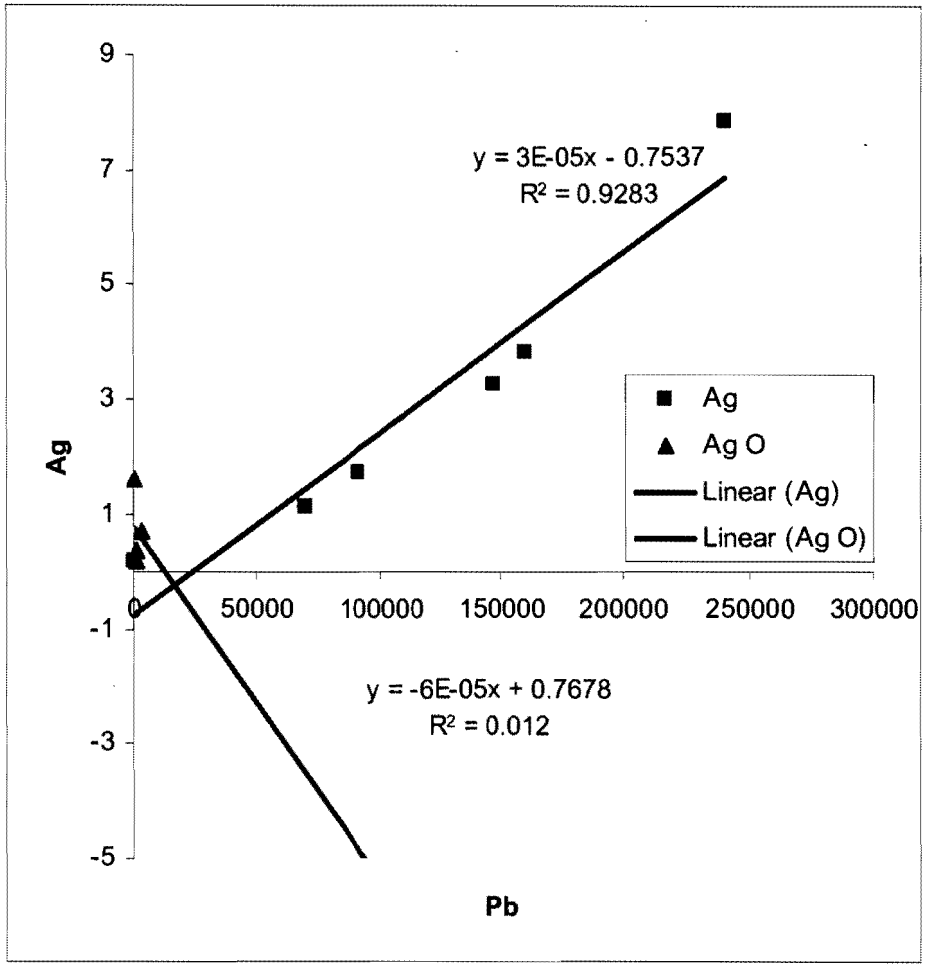
- looking at grouping

- Not necessarily a real strong relationship w/ depth.
  → Most indicative if something has been impacted by a different source.
  → Most surface samples do not have ↑ Pb to Ba ratio.

Same type of relationship that you see in Pb IR data.

nvb
/th





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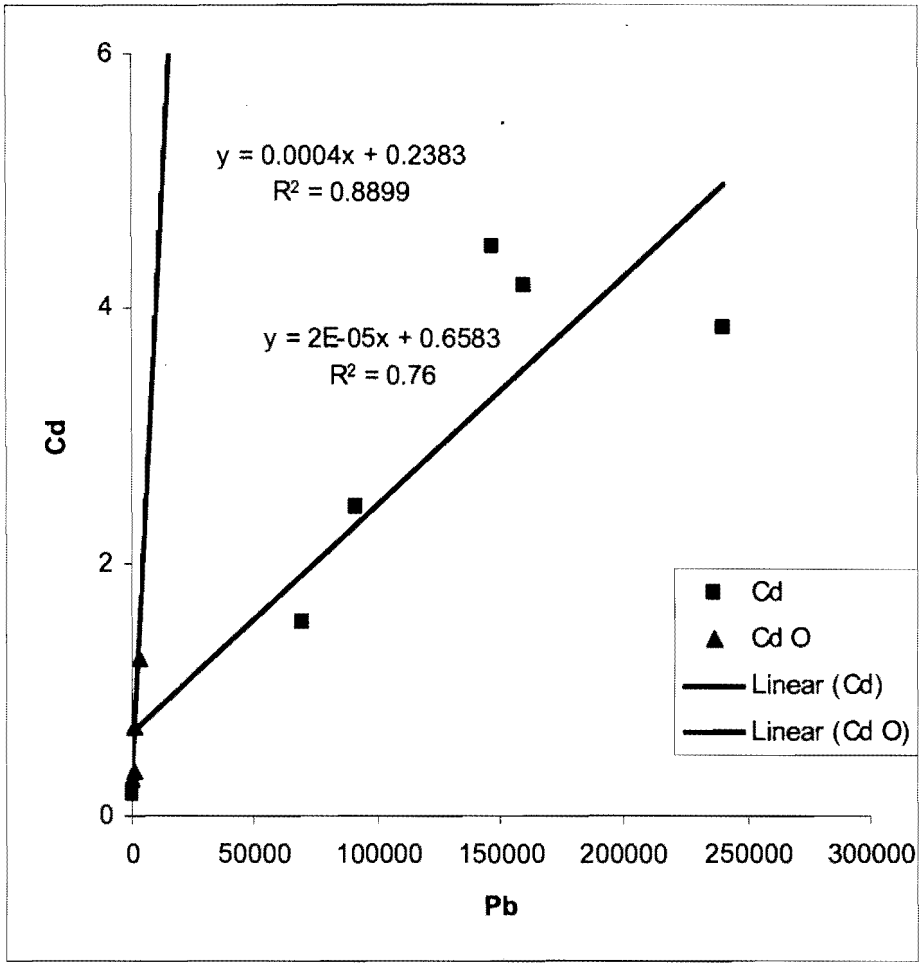
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Cd O
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0
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4
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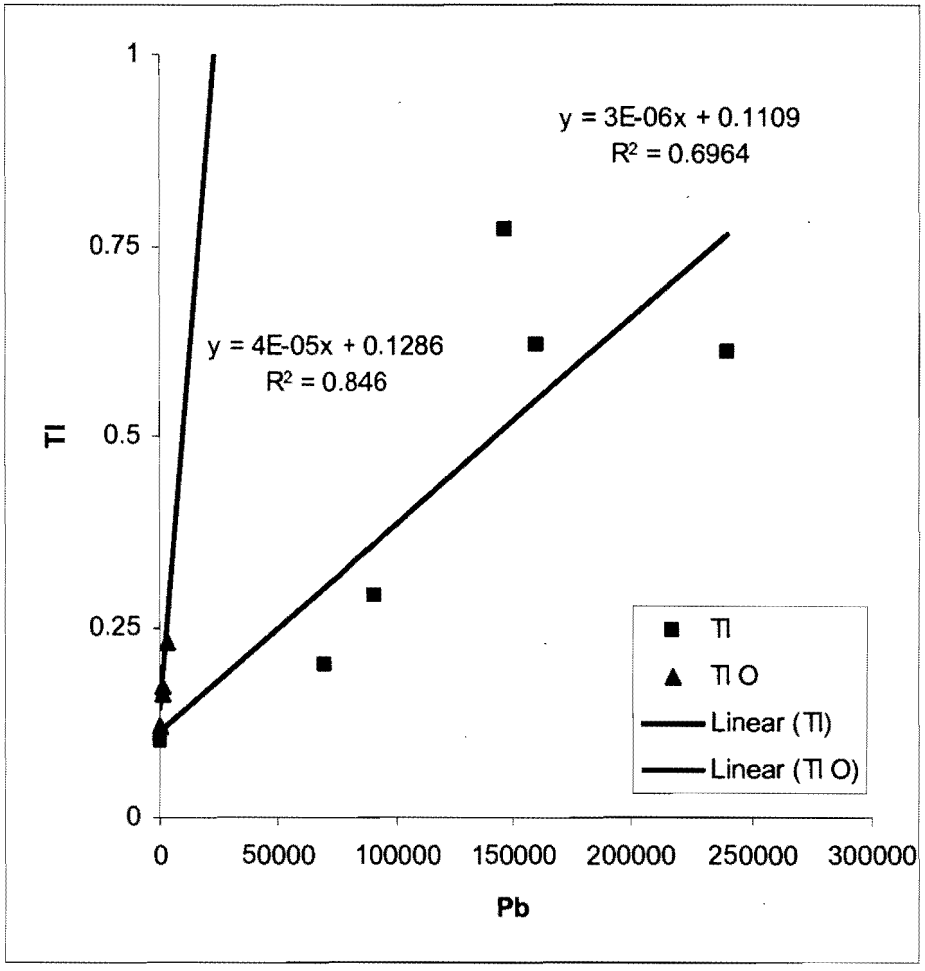
200000
250000
300000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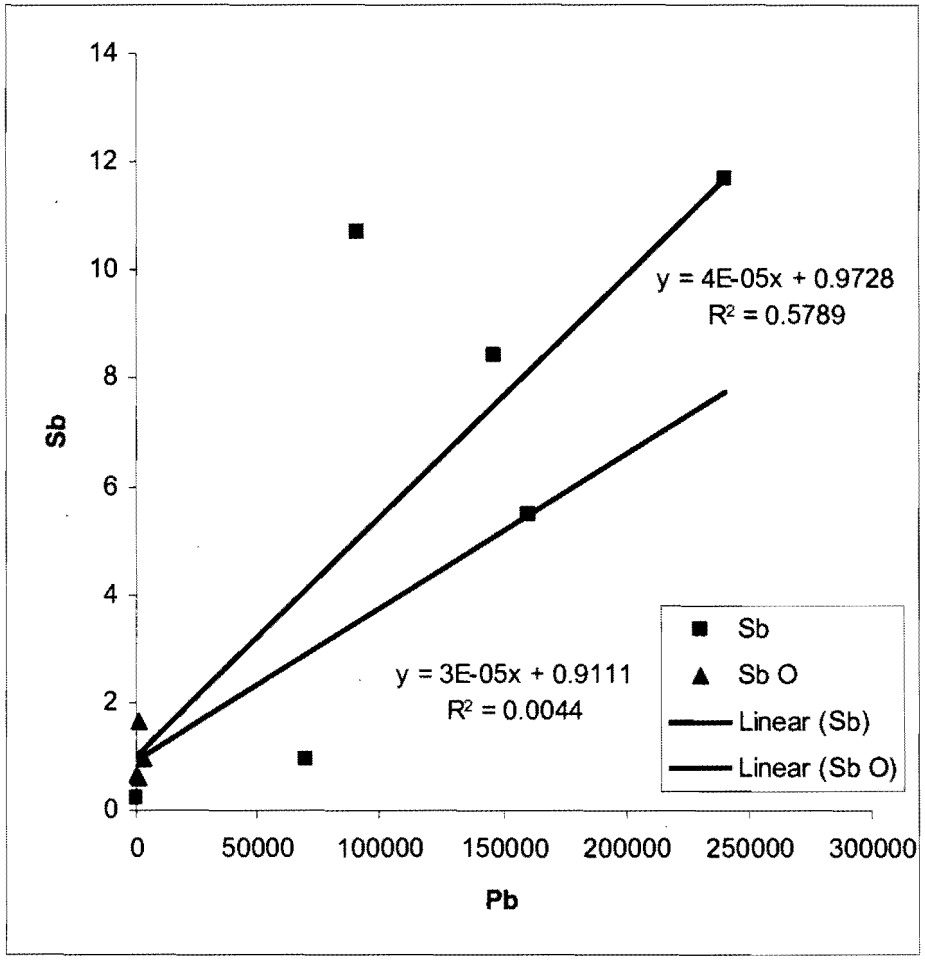
Pb
0
0.25
0.5
0.75
1
0
50000
100000
150000
200000
250000
300000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150000
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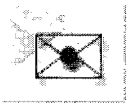

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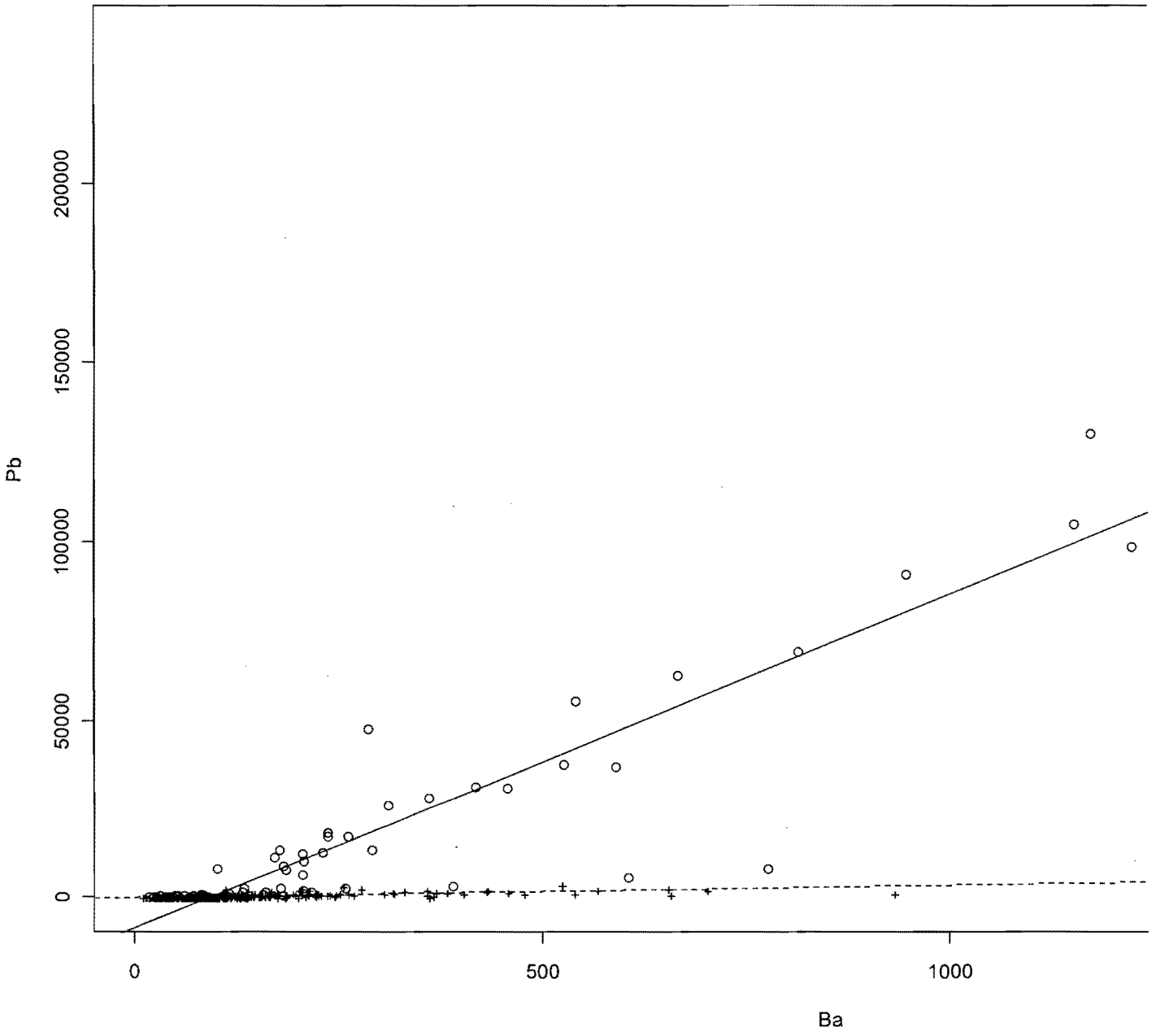

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